

BMC Psychiatry

The power of support from companion animals for people living with mental health problems: A systematic review and narrative synthesis of the evidence --Manuscript Draft--

Manuscript Number:	BPSY-D-17-00638R3	
Full Title:	The power of support from companion animals for people living with mental health problems: A systematic review and narrative synthesis of the evidence	
Article Type:	Research article	
Section/Category:	Social psychiatry, therapy and provision of mental health care	
Funding Information:	National Institute of Health Research (RP-PG-1210-12007)	Prof Karina Lovell
Abstract:	<p>Background</p> <p>There is increasing recognition of the therapeutic function pets can play in relation to mental health. However, there has been no systematic review of the evidence related to the comprehensive role of companion animals and how pets might contribute to the work associated with managing a long-term mental health condition. The aim of this study was to explore the extent, nature and quality of the evidence implicating the role and utility of pet ownership for people living with a mental health condition.</p> <p>Methods</p> <p>A systematic search for studies exploring the role of companion animals in the management of mental health conditions was undertaken by searching 9 databases and undertaking a scoping review of grey literature from the earliest record until March 2017. To be eligible for inclusion, studies had to be published in English and report on primary data related to the relationship between domestic animal ownership and the management of diagnosable mental health conditions. Synthesis of qualitative and quantitative data was undertaken in parallel using a narrative synthesis informed by an illness work theoretical framework.</p> <p>Results</p> <p>A total of 17 studies were included in the review. Quantitative evidence relating to the benefits of pet ownership was mixed with included studies demonstrating positive, negative and neutral impacts of pet ownership. Qualitative studies illuminated the intensiveness of connectivity people with companion animals reported and the multi-faceted ways in which pets contributed to the work associated with managing a mental health condition, particularly in times of crisis. The negative aspects of pet ownership were also highlighted including the practical and emotional burden of pet ownership and the psychological impact that losing a pet has.</p> <p>Conclusion</p> <p>This review suggests that pets provide benefits to those with mental health conditions. Further research is required to test the nature and extent of the relationship, incorporating outcomes that cover the range of roles and types of support pets confer in relation to mental health and the means by which these can be incorporated into the mainstay of support for people experiencing a mental health problem.</p>	
Corresponding Author:	Helen Brooks University of Liverpool UNITED KINGDOM	
Corresponding Author Secondary Information:		
Corresponding Author's Institution:	University of Liverpool	
Corresponding Author's Secondary		

Institution:	
First Author:	Helen Brooks
First Author Secondary Information:	
Order of Authors:	Helen Brooks
	Kelly Rushton
	Karina Lovell
	Penny Bee
	Lauren Walker
	Laura Grant
	Anne Rogers
Order of Authors Secondary Information:	
Response to Reviewers:	<p>Please see below how we have responded to the request for minor editorial changes.</p> <p>1. Please include the email addresses of all authors on the title page of your manuscript.</p> <p>Email addresses for all authors have been added to the title page.</p> <p>2. Please consolidate the Aim heading into the Background heading in the Abstract section.</p> <p>The aim heading has now been consolidated into the background heading within the abstract.</p> <p>3. Please include an Acknowledgements subheading in your Declarations section. In this section acknowledge anyone who contributed towards the article who does not meet the criteria for authorship including anyone who provided professional writing services or materials. Please note that any sections that are not applicable to your manuscript should still be included with the statement "Not applicable."</p> <p>We have now included an acknowledgements section within the manuscript as requested.</p> <p>4. Please upload your revised submission that it is in the final form for publication. Please remove any tracked changes or highlighting and include only a single clean copy of the manuscript.</p> <p>We have now uploaded a revised submission in final form for publication. We have removed any track changes and highlighting and included a single copy of the manuscript.</p>

[Click here to view linked References](#)

**The power of support from companion animals for people living with
mental health problems: A systematic review and narrative synthesis of the
evidence**

Helen Louise Brooks, Department of Psychological Sciences, Institute of
Psychology, Health and Society, University of Liverpool, Liverpool, UK. Email:
helen.brooks@liverpool.ac.uk.

Kelly Rushton, Mental Health Research Group, Division of Nursing, Midwifery
and Social Work, Faculty of Biology, Medicine and Health, School of Health
Sciences, Manchester Academic Health Science Centre, University of Manchester,
Manchester, UK. Email: kelly.rushton@manchester.ac.uk.

Karina Lovell, Mental Health Research Group, Division of Nursing, Midwifery and
Social Work, Faculty of Biology, Medicine and Health, School of Health Sciences,
Manchester Academic Health Science Centre, University of Manchester,
Manchester, UK. Email: karina.lovell@manchester.ac.uk.

Penny Bee, Mental Health Research Group, Division of Nursing, Midwifery and
Social Work, Faculty of Biology, Medicine and Health, School of Health Sciences,
Manchester Academic Health Science Centre, University of Manchester,
Manchester, UK. Email: penny.bee@manchester.ac.uk

Lauren Walker, Mental Health Research Group, Division of Nursing, Midwifery
and Social Work, Faculty of Biology, Medicine and Health, School of Health
Sciences, Manchester Academic Health Science Centre, University of Manchester,
Manchester, UK. Email: lauren.walker-2@manchester.ac.uk

Laura Grant, BSc Psychology student, University of Manchester, Manchester, UK.
Email: laura.grant-4@student.manchester.ac.uk

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35

26 Anne Rogers, NIHR CLAHRC Wessex, Faculty of Health Sciences, University of
27 Southampton, Southampton, UK. Email: a.e.rogers@soton.ac.uk
28
29 Corresponding author: Helen Louise Brooks, Psychology of Healthcare Research
30 Group, Department of Psychological Sciences, Institute of Psychology, Health and
31 Society, University of Liverpool, Liverpool, UK. Tel: 0151 794 8125. Email:
32 Helen.brooks@liverpool.ac.uk.
33
34
35

36 **Abstract**

37

38 **Background**

39

40 There is increasing recognition of the therapeutic function pets can play in
41 relation to mental health. However, there has been no systematic review of the
42 evidence related to the comprehensive role of companion animals and how pets
43 might contribute to the work associated with managing a long-term mental
44 health condition. The aim of this study was to explore the extent, nature and
45 quality of the evidence implicating the role and utility of pet ownership for
46 people living with a mental health condition.

47

48 **Methods**

49

50 A systematic search for studies exploring the role of companion animals in the
51 management of mental health conditions was undertaken by searching 9
52 databases and undertaking a scoping review of grey literature from the earliest
53 record until March 2017. To be eligible for inclusion, studies had to be published
54 in English and report on primary data related to the relationship between
55 domestic animal ownership and the management of diagnosable mental health
56 conditions. Synthesis of qualitative and quantitative data was undertaken in
57 parallel using a narrative synthesis informed by an illness work theoretical
58 framework.

59

60 **Results**

61

62 A total of 17 studies were included in the review. Quantitative evidence relating
63 to the benefits of pet ownership was mixed with included studies demonstrating
64 positive, negative and neutral impacts of pet ownership. Qualitative studies
65 illuminated the intensiveness of connectivity people with companion animals
66 reported and the multi-faceted ways in which pets contributed to the work
67 associated with managing a mental health condition, particularly in times of
68 crisis. The negative aspects of pet ownership were also highlighted including the
69 practical and emotional burden of pet ownership and the psychological impact
70 that losing a pet has.

71

72 **Conclusion**

73

74 This review suggests that pets provide benefits to those with mental health
75 conditions. Further research is required to test the nature and extent of the
76 relationship, incorporating outcomes that cover the range of roles and types of
77 support pets confer in relation to mental health and the means by which these
78 can be incorporated into the mainstay of support for people experiencing a
79 mental health problem.

80

81 **Key words:** Pets, mental health, systematic review, narrative synthesis, self-
82 management, personal communities, networks of support.

83

84

85

86 **Background**

87

88 The rise in people experiencing a mental health problem [1] and the
89 identification of mental illness as the leading cause of disability adjusted life
90 years globally (DALYs)[2, 3] requires concerted effort in identifying and
91 mobilising resources to support people living with a mental health problem.
92 Traditional approaches to the self-management of long-term conditions focus on
93 psychological mechanisms of behaviour change, which have been shown to have
94 some utility for managing symptoms. However, these approaches often fail to
95 take into account the wider resources including material and social relationships
96 in people’s domestic and local environments which form the latent and
97 constituent part of systems of lay and community support [4]. These are
98 increasingly being recognised as holding significant relevance for the
99 management of long-term health conditions [5]. Indication of the potential
100 benefit that pets convey to the experience of mental health comes from evidence
101 detailing the benefits of pet ownership in relation to stress reduction, improved
102 quality of life, and pets as promoters of social and community interaction [6-8].
103 Recent work has shed light on the relevance of pets in the social networks of
104 people with who have received a diagnosis of a severe and enduring mental
105 health illness (e.g. Schizophrenia and Bipolar disorder) [9] suggesting that pets
106 can be considered alongside other human relationships. However, the evidence
107 base for the benefit of pet ownership for those with diagnosable mental health
108 conditions is fragmented and unclear.

109

110 The enduring relationship between humans and domestic animals is well

documented and there are an estimated 10 million cats (23% of households with one or more cat) and 11.5 million dogs (30% of households with one or more dog) kept as pets in the UK [10], with similar rates of ownership found across Europe, Australia, China and Japan [11]. Despite this phenomenon, the potential benefits that owning a pet might confer specifically to mental health has received relatively little attention. Research has focused on formalised animal contact in closed settings such as Animal Assisted Therapy (AAT). Multiple reviews have considered AAT in a variety of fields including intellectual disability[12], autism [13], general healthcare [14, 15] and neuro-rehabilitation [16, 17], but there are no systematic syntheses of the role and effects of the less structured animal contact provided by pet ownership in open settings for people with mental health conditions. The provision of ongoing support in normalised everyday settings remains an aspiration of mental health policy but the mapping of the nature of resources available and how they are, and can be, deployed remains underexplored.

Underlying theoretical framework

This review draws on a framework of long-term condition ‘work’ informed by Corbin and Strauss [19] which was developed in the context of exploring the contribution and division of labour provided by intimate and weak ties in personal communities in relation to living with a long term condition [4, 5, 20, 21]. This approach allows for an in-depth analysis of the role of pets in relation to the tasks that need to be done to manage mental health in the context of people’s everyday lives to consolidate the evidence base in this regard. Practical

136 work consists of tasks undertaken by network members which are practical in
137 orientation and includes general practical activities such as housekeeping,
138 personal care and diet and exercise activities but also illness specific practical
139 tasks such as taking medication, understanding symptoms, making
140 appointments and preventative work to avoid crises. Emotional work relates to
141 wellbeing, providing companionship and being a source of comfort when
142 worried about everyday matters or specific illness matters. Biographical work
143 relates to the tasks and generation of ontological security, required to retain a
144 positive sense of identity and give life meaning again post diagnosis. This
145 involves assessments of personal expectations, capabilities, relationships and
146 biographical events. These types of work are distributed amongst weak as well
147 as close ties [22]. This framework has been used in preference to more
148 traditional notions of social support as it allows for the inclusion of an in-depth
149 understanding of the open system resources, networks and relationships that
150 people draw on when managing a long-term condition in their everyday lives [4].
151 The framework was used to guide the narrative synthesis of the studies included
152 in the review.
153
154 This review aimed to explore the nature, extent and quality of the evidence
155 demonstrating the role of pet ownership for people with mental health
156 conditions.
157
158 *Review questions:*
159

1. What is the nature, extent and quality of the evidence demonstrating the role of pet ownership for those with mental health conditions, with or without comorbid physical health conditions?

2. What is currently known about the mechanisms underlying any impact?

Methods

A comprehensive search of 9 electronic databases was undertaken in March 2017. The methods and reporting of the results of this systematic review are described according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [18].

Eligibility criteria

The review sought to identify studies that reported primary data, which investigated the relationship between pet ownership and diagnosable mental health conditions. Inclusion/exclusion criteria can be found in Table 1. All participants in the sample had a diagnosable mental health condition or mental health problems associated with a diagnosed physical health condition. Papers were excluded if it was unclear who the sample were and could only be included if specific reference to diagnosable conditions was made.

Table 1: Inclusion/Exclusion criteria

<i>Inclusion Criteria</i>	<i>Exclusion criteria</i>
---------------------------	---------------------------

English language paper	Not an English language paper
Primary data	Not primary data (e.g. systematic or review article/opinion piece)
Peer reviewed journal article/conference paper/research dissertation	Not a peer reviewed journal article (e.g. books/book chapters)
Related to pet ownership and domestic animals	Studies unrelated to pet ownership (e.g. Animal assisted therapy which does not involve the direct ownership of domestic animals)
Related to the impact of pet ownership on diagnosed mental health conditions or co-morbid mental health related to long-term physical conditions.	Not related to the impact of pet ownership on diagnosed mental health conditions or mental health components of long-term physical conditions or the nature of the sample was unclear.

183

184 Studies were not excluded by date of publication or sample size. However, those
185 that were not published in the English language, were only published in abstract
186 form, or were not accessible via inter-library loan were not included in this
187 review.

188

189 *Search strategy and data sources*

190

191 Electronic database searches were undertaken in March 2017 from the earliest
192 record to March 2017 using ASSIA, CINAHL Plus, Embase, International
193 Bibliography of the Social Sciences, Medline, PsychInfo, Social Science Full Text,
194 Sociological Abstracts, and Web of Science. Grey literature sites were also
195 searched including OpenGrey, Index to Theses, Electronic These Online Services,
196 The Health and Social Care Information Centre Website and the Association of
197 Health Observatories Website.

198

199 The search strategy was organised around four key areas: 1) Participants'
200 perspectives, 2) Pet ownership, 3) Diagnosed mental health conditions or co-
201 morbid mental health related to long-term physical conditions and 4) impact of
202 pets on mental health management. The search strategy was informed by
203 published reviews, discussion within the wider project team, consideration of
204 MeSH terms and the wider literature in the area of pet ownership. HB piloted
205 search terms in a number of databases with input from an information
206 technology specialist. Papers identified through piloting were assessed for
207 additional terms, subject headings and key words with the aim of further
208 refining the search strategy. A copy of the final search strategy is available from
209 the author. Within each PICO component agreed search terms were combined
210 using the Boolean operator 'OR' and across components using 'AND'. The search
211 was adapted for the individual databases and websites as required.

212
213 *Review Strategy*

214

Search results were uploaded to Endnote before removing duplicates and exporting into the data management software Covidence ([www. Covidence.org](http://www.Covidence.org)). The first stage of the review process involved single screening at the level of title and abstract (see Table 1 for a list of inclusion and exclusion criteria). An additional reviewer independently reviewed all excluded references for validity purposes. Full texts of included articles were obtained for the purposes of full text screening. Full texts were screened for inclusion independently by two reviewers and inclusion/exclusion conflicts were resolved by a third reviewer. Acceptable concordance was predefined at 90% [23]. A concordance rate of 93% was achieved at first rating (29 exclusion/inclusion conflicts).

The reference lists of included papers were also manually searched for relevant papers. A Google Scholar alert was created in February 2017 and stopped in August 2017, which did not identify any additional articles for inclusion.

Figure 1: PRISMA flowchart

[Insert figure 1 here]

Data extraction

Electronic forms were created in Microsoft Excel for the purpose of data extraction. Data was double extracted independently by two authors who each extracted all studies. Disagreement between extractors, which consisted of mostly minor additional detail, was resolved by consensus between authors.

240

241 The aim of the review was to explore the impact of pet ownership on diagnosed
242 mental health conditions (or co-morbid mental health symptoms associated with
243 other long-term conditions). Where data was available from quantitative
244 outcomes of mental health, these were extracted. Where data were not available
245 in the manuscript, authors were contacted by email to request relevant data.

246

247 *Quality assessment*

248

249 Included articles were assessed for relevance by HB, KR and AR and for quality
250 by HB and KR using criteria adapted from the Qualitative Research Review
251 Guidelines - RATS and the Quantitative Assessment tool for Quantitative Studies
252 [24]. Any disagreements were resolved by discussion between authors. The
253 quality assessment included assessment of potential bias in terms of selection
254 and response and the reliability and validity of the methodology utilised. No
255 study was excluded on quality alone [25]. Studies were given one point for each
256 quality criteria the study met (see Additional Files 3 and 4) and this was used to
257 guide the narrative synthesis of the studies included in the review.

258

259 The quality assessment process generated an average quality rating of 5.5 out of
260 10 for qualitative studies and 8.75 out of 10 for quantitative work (refer to
261 additional files 3 and 4). There were no RCTs evaluating the impact of pet
262 ownership on diagnosed mental health conditions.

263

264 *Data Synthesis*

265

266 A deductive, thematic synthesis approach was constructed collaboratively
267 between two authors (HB, KR) and the resultant analytical framework was
268 elaborated and checked by a third (AR). Quantitative and qualitative data were
269 synthesised and combined in parallel. Primary findings in each study were coded
270 in line with the concepts of the networked work of illness management identified
271 above which identified a set of three core types of work deployed by social
272 network members of an individual's personal community of support (*practical,*
273 *emotional and biographical work*). We utilised a constant comparative approach
274 to analysis to enhance the likelihood that concepts were translated successfully
275 from one study to another [26]. Descriptive themes emerged which were used to
276 describe groups of codes within each category of work. Using the framework we
277 were able to draw comparisons between these themes and move beyond the
278 primary findings presented within each individual paper. Individual benefits and
279 disadvantages of pet ownership were considered in terms of the conditions and
280 contexts they emerged from.

281

282 **Results**

283

284 The search resulted in 17 studies for synthesis; the flow of studies is outlined in
285 Figure 1. All study characteristics and quality indicators are detailed in
286 additional files 1-4. Of the 17 studies, 8 were conducted in the USA [27-34], 4 in
287 the UK [9, 35-37], 2 in Canada [38, 39] and 1 each in the Netherlands [40],
288 Australia [41], and Sweden [42]. Twelve of the studies were reported in journal
289 articles [9, 27, 30, 32-35, 38-42] and 5 were part of doctoral research [28, 29, 31,

290 36, 37]. Eight of the studies used qualitative methodology [9, 27, 28, 31, 34, 36,
 291 37, 42], 6 were quantitative [29, 30, 33, 38-40] and 3 used mixed methods [32,
 292 35, 41]. Methods used in the qualitative work including grounded theory [32, 36]
 293 thematic analysis [41, 42] phenomenology [28, 31] and framework analysis [9].
 294 Quantitative studies employed cross-sectional survey design and used a variety
 295 of descriptive statistics [29, 30, 32, 33, 35, 39-41] correlational analysis [41] and
 296 regression analysis [29, 33, 35, 40].
 297
 298 All participants in the studies resided within the community and had either a
 299 diagnosed serious mental health condition [9, 30-32, 38, 39], mental health
 300 problems associated with a physical health condition [29, 33-35, 40, 41], mental
 301 health problems associated with a developmental disorder [37, 42] or self-
 302 reported mental health conditions [27, 28]. Two of the studies involved
 303 interviews with parents of children who had a family pet [37, 42], the remaining
 304 studies collected data directly from participants with a companion animal.
 305 Twelve of the studies included all types of companion animals [9, 27, 31-36, 39-
 306 42] and four specifically focused on either dogs and/or cats [28-30, 38]. A total of
 307 1727 pet owners were involved in the included studies.
 308
 309 Of the 17 included studies, 15 reported positive aspects of pet ownership for
 310 people experiencing mental health problems [9, 27-30, 32-40, 42] and 9 reported
 311 negative elements [9, 27, 32, 35, 36, 38, 39, 41, 42]. Neutral effects of pet
 312 ownership were reported in some of the included quantitative studies, where no
 313 difference in mental health outcomes, social contacts or loneliness were reported
 314 for pet owners compared to non-pet owners [29, 32, 35, 40]. Benefits were

1 315 mostly demonstrated through qualitative data, and negative elements, which
2 316 were highlighted, were largely over-shadowed by co-occurring positive impact of
3
4 317 pets in these studies [9, 27, 32, 35, 36, 38, 42].
5
6

7 318

8
9 319 *Themes*
10

11 320

12
13 321 *Emotional work - alleviating worry, providing comfort and mitigating against*
14
15 322 *feelings of isolation and loneliness*
16
17 323

18
19 324 Evidence from quantitative studies relating to contribution of pets to emotional
20
21 325 work was mixed. There were significant findings for the benefits of canine
22
23 326 companionship for military veterans with post-traumatic stress disorder (PTSD),
24
25 327 including effects on reducing feelings of loneliness, depression, worry and
26
27 328 irritability, and increased feelings of calmness [18] and there was some evidence
28
29 329 for the direct effect of pets on depression and mood [30, 35] through close
30
31 330 proximate contact and stroking [35]. However, this finding was not wholly
32
33 331 supported by other quantitative studies, which reported neutral or small
34
35 332 negative effects of pet ownership [17, 23, 28, 29]. A study investigating the effect
36
37 333 of pet ownership and strength of attachment on depression, found that pet
38
39 334 owners were just as likely as non-pet owners to be depressed [33]. However this
40
41 335 focussed on the sequela of depression not its alleviation or contribution of pets
42
43 336 to managing post diagnosis. Interestingly, a study by Siegel found that pets had
44
45 337 an effect in mediating the relationship between AIDS diagnosis and depression
46
47 338 and that there was a weak trend towards dogs being more successful in this role
48
49 339 than cats [33].
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

340

341 The importance of pets in relation to the provision of emotional work was a
342 recurrent theme in the numerous qualitative studies included in the review
343 where people reported a profound connection with their pet [9, 27, 30-32, 38,
344 39] sometimes preferring relationships with pets over relationships with other
345 humans [37] and viewing pets as replacement family members [32]. The
346 mechanisms through which pets made the perceived contribution to emotional
347 work seemed to be the provision of a consistent source of comfort and affection
348 [9, 34, 36, 41, 42]. This constant presence meant that this provision was available
349 instantaneously without request [9, 27, 36, 42]. Pets provided calming support
350 and were perceived to have a 'sense' of when it was needed.

351

352 *"The dog approaches Karin when she's crying and comforts her by lying*
353 *next to her and licking away her tears. The dog hears her, and wherever he*
354 *is in the house, he comes to her. We can't always comfort her. Sometimes*
355 *Karin has said, 'It's a good thing we have the dog, otherwise no one would*
356 *be able to comfort me". [42]*

357

358 Pets were able to provide unique emotional support as a result of their ability to
359 respond to their owners in an intuitive way, especially in times of crisis and
360 periods of active symptoms [9, 30, 31, 35, 36]. A related impact on loneliness was
361 achieved through physical contact which reduced feelings of isolation [28, 36],
362 providing a source of physical warmth and companionship [35], and by
363 providing opportunities for communication [34, 36].

364

365 *"It is very important of people not to feel alone and isolated, and pets help*
366 *you feel like you're like everyone else. Not less than other people. My birds*
367 *are very important to me and I think other people with other pets feel that*
368 *way, too."* [27]

369
370 The study by Ford found that people were able to confide in their pets when they
371 were unable to open up to other people.

372
373 *"Sometimes if I talk to the cat, perhaps it's like being in a confessional, I find*
374 *I can address things that perhaps I wouldn't have done normally if I hadn't*
375 *have had the cat to talk to."* [36]

376
377 In this respect, pets provided a safe environment where people can talk without
378 fear of being judged or being a burden to others [11]. This was echoed in work
379 where people reported that their dogs allowed them to express their feelings and
380 clarify their thoughts without the concern that they will interrupt, offer criticism
381 or advice, or betray confidence [30, 31].

382
383 *"They don't have input, "this is what you should do, or maybe you should try*
384 *this" or all the other commentary I get from people, who are trying to be*
385 *helpful in their own right...their dying devotion and love, it's true*
386 *friendship."*[31]

387
388 The sentiment of pets being non-judgemental underpins the absence of
389 conditionality, which was a recurring finding in included studies. Pets provided

390 unconditional love and affection [9, 30, 31, 34, 42] which fostered self-
391 acceptance and congruence [28]. Pets constituted a source of support which
392 people could trust and rely on compared with other social network members [9];
393 they provided simple relationships free from conflict [28] and they did not
394 overstep boundaries [31]. The latter seems to be particularly beneficial for
395 people with Autism [37] and PTSD [30].

396

397 *"The dog offers comfort in a different way to how I do, more unconditional.*
398 *Åsa can hold the dog when she is feeling miserable. The dog doesn't ask why*
399 *or what's happened."* [42]

400

401 By providing unconditional positive regard, pets promoted emotional stability
402 through the regulation of feelings, management of stress and helping people to
403 cope with difficult life events [27, 42]. For people living alone, pets provided a
404 source of 'connectedness' [27], reassurance, and normalcy [31].

405

406 *She's always there for me in a regular way of managing my stress. I tell her*
407 *about my days, she snuggles, cuddles and sleeps with me. [34]*

408

409 *Practical work - physical activity and symptom distraction*

410

411 Quantitative data implicating pets in the practical work associated with mental
412 health management pointed to the impact of dog ownership on physical activity
413 [40] and self-report quality of life related to physical health [29]. One study

414 found that those with pets were more significantly likely to use ambulatory
 415 mental health care than those without. [28].
 416
 417 Qualitative results from the studies expanded on illness specific practical work
 418 including at times of crisis [9, 28, 30-32, 35-38, 41, 42]. The main mechanism
 419 through which pets appeared to contribute to practical work was through the
 420 ability of pets to distract and disrupt attention from symptoms or upsetting
 421 experiences such as hearing voices, panic attacks or suicidal ideation [9, 27, 28,
 422 30-32, 34, 36]. Pets contributed to practical work directly and indirectly by
 423 acting as a form of bridging tie to additional resources.
 424
 425 *But if I'm here and I'm having...having problems with voices and that, erm, it does help me in*
 426 *the sense, you know, I'm not thinking about the voices, I'm just thinking of when I hear the*
 427 *birds singing [9]*
 428
 429 One quantitative study by Stern and colleagues [18] demonstrated that whilst
 430 participants with PTSD did not report feeling less affected by painful memories
 431 or flashbacks they indicated that their pet tried to cheer them up when
 432 experiencing symptoms indicating that the presence of their pet may have
 433 lessened a modicum of the negative impact of trauma [9, 27, 28, 30-32, 34, 36].
 434
 435 Qualitative data pointed to the way in which pets were able to undertake the
 436 activities of practical work because of their consistent and proximate presence
 437 and through providing the opportunity for reciprocity [9, 27, 31, 34, 36]. Pets'
 438 contribution to practical work is seemingly made possible through the provision

of opportunities for routine tasks required to care for an animal, providing a positive focus for activity [9, 27, 30-32, 34, 36, 42], providing a needed challenge [24], by introducing humour into situations [11], providing a direct grounding role [30, 31, 38], lessening the negative impact of symptoms [9, 30] and reducing the stress associated with the vagaries of living with their condition [34]. One study found that participants felt that they required less medication because of this pet contribution [31].

So the physical thing of having to brush her and take her out and feed her, check that her toenails don't need cutting, you know perhaps pick up after her if she's had an accident, things like that. Cos she can be quite demanding as you've seen, she's up and she wants attention all the time, so it...interrupts your thought process a lot of the time. [36]

They are something that is very important in my recovery and helping me not get too depressed. Even when I was so depressed, I was kind of suicidal. I never got really bad, but I was suicidal at one time. The thing that made me stop was wondering what the rabbits would do. That was the first thing I thought of and I thought, oh yeah, I can't leave because the rabbits need me. So they were playing a really big role in that. [32]

Pets could contribute to a sense of preparedness to take self-management action through increasing people's positivity and self-efficacy [32, 34, 41, 42]. They encouraged their owners to stay in the present avoiding worry and ruminations about past behaviours [28, 30] or concerns about the future [34]. Pets were also considered important in terms of providing protection for their owners [28, 31]. This was particularly of value for those participants experiencing the constant vigilance associated with Post Traumatic Stress Disorder [31].

465

466 *He'll start nudging me or hopping on me to get me into a petting session or he'll grab my*
467 *pants leg and start pulling on me or like my shirt or my arm and start pulling on me to kind of*
468 *like bring me out of a flashback or anything else like that. [31]*

469

470 Owners felt that their pets could sense when practical support for mental health
471 was required and acted accordingly [9, 28, 31, 42]. However, this was not
472 universal to all studies indicating the impact of pets cannot be fully explained by
473 this behavioural initiation [37].

474

475 *The puppy followed Bengt's mood from the very first day. The dog reads him inside and out,*
476 *she knows exactly when to go to him and when to keep back. If Bengt is unsettled and*
477 *moving around, he may stop occasionally and sit down ... and then along she comes. Then*
478 *she kneels down and starts to nudge and lick him, and he starts to stroke her. She also knows*
479 *if he's in conflict with us. Then she follows him ... and if he hasn't closed his door, she goes in*
480 *and sits with him. [42]*

481

482 *Pam named the contact itself as playing a significant role in helping her to manage anxiety*
483 *attacks. She specifically described an example of when her companion dog came to her*
484 *during an anxiety attack in the middle of the night: Brutus licked her face and laid next to her*
485 *for the rest of the night, and contact with him immediately improved her acute symptoms*
486 *[28]*

487

488 Indirectly, pets encouraged a form of behavioural activation. Pets were seen to
489 enhance mobility [41], increase exercise [30, 35, 36, 40] and promote contact
490 with nature [30, 36] all of which were considered beneficial to mental health.

491

492 *Pets as conduits to social interaction and emotional nourishment*

493

494 A feature of the role attributed to pets in terms of mental health management in
495 the qualitative data was the various ways in which they facilitated the quality
496 and quantity of social interactions. Pets reportedly increased social interaction
497 with others including friends and family [34] and with more peripheral social
498 interactions [9, 38]. They also fostered a sense of social and community
499 integration [9, 32, 35, 36, 38, 42]. Interestingly, one study found that dogs
500 increased social interactions that would not have been possible without their pet
501 (e.g. other dog walkers [36]). This was supported by some [39] but not all of the
502 included quantitative studies [17, 20, 27, 28] indicating a complicated
503 relationship between pets and social interaction which may be mediated by type
504 of pet and/or number of pets [18].

505

506 *Get out of the scope of a physical disability. I mean a physical disability yeah. I can't get*
507 *through that door. I can't get up those steps. For a mental health patient it is not the physical*
508 *barrier it's an invisible [barrier] . . . Yes, these guys help me interact. Butch, when we go out . .*
509 *. when Butch and I go out, we interact because he gets so much attention and with the*
510 *attention focused on him, I can get engaged in all sorts of conversations with people who like*
511 *dogs, so with these guys we develop friends who are into the same thing. [38]*

512

513 *That surprised me, you know, the amount of people that stop and talk to him, and that, yeah,*
514 *it cheers me up with him. I haven't got much in my life, but he's quite good, yeah [9]*

515

516 The reasons identified in the literature as to why pets were considered useful in
517 terms of enhancing the amount and quality of social interactions included having

the confidence to venture into new social situations with their pet, owners finding it easier to be in the presence of other people when their pet was present [18], being more open during social interactions [28] and being able to have difficult conversations with existing friends and family through their pet [34, 36].

522

Biographical work - identity, a sense of self-worth and existential meaning

524

The data implicating pets in biographical work was mostly derived from the qualitative data. Two quantitative studies addressed this type of work; one found that despite a low effect score, pet owners performed significantly higher than non-pet owners on meaningful activity scales [39] and another found that since getting their pets individuals felt better about themselves as people [18].

530

Qualitative data suggested that pets provided their owners with a sense of purpose and gave meaning to their lives [41]. Often participants described how this had been diminished since diagnosis with a mental health condition but that pets helped them to overcome this and provided them with a platform for going forward with their lives [9, 38]. This sense of meaning and purpose included pets giving their owners a reason to live [9, 32], to contributing to a sense of control and empowerment [9, 31, 32, 35] and giving individuals hope for the future [9, 31]. This was considered particularly important when people were feeling consumed by illness or when self-management felt out of control [32].

540

It gives me something to do, to take care of them, the cleaning of the cage, feeding them.

[34]

543

544 Owners' felt that their pets contributed directly to maintaining a consistent sense
545 of identity and self [9, 27, 32, 36, 39, 41]. They felt pets provided a form of
546 validation through the pride associated with successfully caring for a pet [9, 28]
547 but also as sustaining elements of pre-illness identities including roles of mother,
548 pet owner or animal lover [9, 36] and as being a protector of animals [28, 31].

549

550 *My best quality is that I love animals and I take care of animals... Other than that, I*
551 *can't think of anything real outstanding. [32]*

552

553 Pets were also considered relevant in terms of mediating how other people
554 viewed them [9, 42]. Pet ownership connected their owners to valued activities
555 such as hobbies [35] and were considered a culturally sanctioned meaningful
556 occupational and social role [38, 39]. One study also indicated that the mastery
557 achieved through the training of animals also contributed to a positive sense of
558 self [9].

559

560 Participants described elements of relationships with pets that were important
561 to their mental health including the nature of relationships as simple and
562 reciprocal, pets as understanding and honouring personal boundaries and pets
563 not holding past behaviours against them [9, 27, 32, 36, 39, 41]. These
564 components were often missing from other human relationship and were
565 considered important aspects of the human/pet dyad [9].

566

567 *For Irene, taking care of her companion dog facilitated a change in her sense of self, from*
568 *seeing herself as someone who "destroyed anything [she] loved" to seeing herself as a loving,*
569 *nurturing protector[28].*

571 *There's a lot less things to worry about. I mean you can't...you can't like be like if he was*
572 *naughty or anything like that you'd tell him off and that was it and there'd be no hard*
573 *feelings. That there's not, you don't get the nastiness. [9]*

574

575 Pets impacted directly on the management of negative perceptions and
576 experiences related to a diagnosis of mental illness which arose either from
577 themselves or from others within and outside of their existing social networks
578 [9, 28, 31, 34, 35, 39]. The mechanisms through which this appeared to operate
579 included counterbalancing a loss of social status as a result of being diagnosed
580 with a mental illness, providing non-judgemental acceptance often not available
581 elsewhere [9], making owners feel wanted and valued [34, 39] and encouraging
582 owners to feel good about themselves [28, 30]. One study proposed that
583 companion animals symbolised abused childhood selves and that by caring for a
584 pet they may have symbolically been caring for this part of themselves.[28]

585

586 *When he comes and sits up beside you on a night, it's different, you know, it's just, like, he*
587 *needs me as much as I need him, sort of thing*
588 *[9]*

589

590 *Negative aspects of pet ownership*

591

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

592 Despite an overall sense of the positive impact of pet ownership on the
593 management of diagnosed mental health disorders, some negative aspects
594 surfaced within individual quantitative and qualitative studies. This included
595 aspects such as financial costs and housing situations, the burden of pet
596 ownership especially if pets were unruly which could be detrimental to mental
597 health and the guilt that owners experienced if this was not managed
598 successfully [9, 35, 36, 38, 39]. Horses and dogs were considered the most
599 burdensome in this regard and research highlighted the importance of matching
600 pets to individual circumstances [36]. The early stages of pet ownership were
601 often the most difficult for people but were concomitantly considered as an
602 important investment in terms of future support and companionship [35]. Pets
603 could also be seen as a barrier to aspirational goals associated with recovery
604 such as travel [9, 35]

605

606 *When I was working it wasn't a problem, but obviously when you're on a low budget income,*
607 *it does become a financial hazard, because they're just unexpected you know. That's where*
608 *the issues become, do you keep them or do you...and you don't want to let them go so you're*
609 *sitting there, having to cut back and scrape the bottom of the barrel to make sure they're*
610 *looked after sort of thing [36]*

611

612 *I was trying to care for 3 cats of my own that I loved, stray cats in the neighbourhood*
613 *I was feeding. I tried to spay the ones that appeared to be pregnant, and I was putting*
614 *food out twice a day, and I was just feeling overwhelmed, just overwhelmed and more*
615 *and more depressed, more a sense of failure, and finally it just got worse and worse*
616 *and worse. [32]*

617

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

618 The potential or actual loss of beloved companion animals was a major source of
619 distress for owners [9, 32, 38, 42] but it was acknowledged that joy could still be
620 taken in their memories once death had been come to terms with [32] and that
621 such experiences could facilitate understanding of other difficult life events [42].

622
623 *I was very depressed by [pet's] death. While she was getting worse, we had her home*
624 *for a while and I had to make myself be strong [...] It was more after her death that*
625 *I kind of broke down, and just thinking about her would make me cry for a couple of*
626 *weeks or more. Gradually I got to the point where I knew that it was her time. The*
627 *life that she had and what she had given to me, I could always think of that. It always*
628 *makes me happy. [32]*

629
630 Participants described how other people including health professionals were
631 often concerned about the safety of their pets and their ability to care for them
632 [27, 33]. Siegel *et al.*, demonstrated that those with HIV felt there was a
633 perception that they should not have pets as a result of their condition. This may
634 also apply to those with mental health conditions but this was not covered in any
635 of the included papers.

636 637 **Discussion**

638
639 This review represents the first attempt to systematically identify and synthesise
640 evidence related to the benefits of pet ownership for those with diagnosed
641 mental health conditions. The majority of relevant data extracted for purposes of
642 this review were qualitative and high quality prospective experimental studies
643 were distinctly lacking. This indicates that the evidence in relation to the role of

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

644 pets for the management of diagnosed mental health conditions is at an early
645 stage and currently disparate and exploratory in nature. The use of thematic
646 analysis informed by an existing framework led to the identification of a number
647 of mechanisms through which companion animals were seen to support their
648 owners to manage their mental health conditions. Very little data fell outside of
649 the framework and what did related mostly to the demographics of pet owners.
650 The results support the wider health benefits of companion animals for the
651 general population [3-9]. However, the discrepancy often identified between
652 quantitative and qualitative findings within the review and the range of factors
653 mediating the relationship between pets and their owners identified within
654 existing literature speaks to the complexity of this relationship. Mediating factors
655 included the type of pet [21], the number of pets [18], perceived friendliness of
656 pet [29] and attachment to pet [21].
657
658 Pets were implicated in emotional work because they provided a consistent and
659 proximate source of calming support and companionship [9, 27, 30-32, 38, 39].
660 This was enhanced through a perception that animals could intuit when such
661 support was needed and act accordingly providing a depth of connection that
662 was considered particularly useful in time of crisis [11, 18, 19, 23, 24].
663 Companion animals contributed to practical work through their role in the
664 distraction and disruption from upsetting symptoms and experiences [9, 27, 28,
665 30-32, 34, 36] through the provision of routine and a role in behavioural
666 activation [20, 22, 29, 30]. Pets were considered important in the maintenance of
667 a positive identity and sense of self because of the reciprocity associated with
668 human-pet dyads [9, 27, 32, 36, 39, 41], a perception that pets accepted their

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

669 owners without judgement, the sense of pride associated with successfully
670 caring for an animal [9, 28] and supporting the management of felt and enacted
671 stigma [9, 28, 31, 34, 35, 39]. Qualitative data demonstrated the relative strength
672 of the role of pets in relation to all three types of work but quantitative data was
673 unavailable to unanimously support this impact particularly in relation to
674 practical and biographical work where quantitative evidence was distinctly
675 lacking. Existing quantitative studies failed to include measures which
676 adequately addressed the potential roles of companion animals as identified
677 within the qualitative data such as self-efficacy and preparedness to take action.
678
679 Despite the mixed evidence from the quantitative data, the participants included
680 in the review enjoyed keeping their animals and believed that they gained
681 psychological benefit from these relationships as demonstrated by the thick
682 descriptions derived from the qualitative data. The review demonstrated that
683 those with diagnosable mental health problems can infer the same benefits from
684 pet ownership as the general population and pets may have a particular role in
685 terms of enhancing quality of life given that levels of social exclusion and stigma
686 are likely to be greater for this population [9, 32, 35, 36, 38, 42].
687
688 Participants felt that their pets facilitated the quality and quantity of existing
689 social interactions and forged new relationships acting as a bridging tie to
690 emotional nourishment [11, 20, 22, 23, 24, 26, 30]. This is likely to be of
691 increasing importance given that social isolation is both a cause and effect of
692 mental illness and that those with mental illness are considered one of the most
693 socially isolated social groups[43].

694

695 Despite these identified benefits, it appeared that relationships with companion
696 animals are not considered or incorporated into health care planning or wider
697 health related discussions of consultations [11]. The contrary appears to occur
698 where individuals are advised against pet ownership or experience negative
699 attitudes from health professional in relation to their pet [21-22]. This indicates
700 pet ownership can create additional work for professionals in terms of managing
701 and advising people and highlights the need for a focus on professional attitudes,
702 which is currently lacking from the evidence base.

703

704 The findings call for cultural changes in policy towards the way in which pets can
705 be incorporated with other support in open systems which is often left
706 untouched or unconsidered by formal service provision. A different logic of care
707 is required one which values the harnessing of available and valued support
708 identified by people which supports individuals' capacity to undertake valued
709 activities (such as dog walking) and look for support which does not engage
710 them in unequal power relationships which can sometimes be anti-therapeutic.
711 With increasing emphasis being placed on evidence based health care, such
712 macro-level policy changes are likely to necessitate strengthening the
713 underpinning evidence base given the low quality of evidence identified within
714 the review. Further exploration of the implementation feasibility and optimal
715 implementation models may also be required, including the potentially
716 important role of inter-agency and third sector working.

717

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

718 Negative aspects of pet ownership identified in the review included concerns
719 about potential, and the significant distress associated with the actual, loss of a
720 pet supporting previous research [44]. Evidence from those involved in natural
721 disasters such as hurricanes suggest that pet loss can add considerably to acute
722 trauma and increase the risk of long-term impacts [45, 46]. This highlights the
723 potential for the loss of an animal to be of greater impact for those with
724 diagnosable mental health conditions given the intense and positive
725 identification reported with their pet and suggests the need to consider pets in
726 planning and delivery of mental health care.

727

728 *Strengths and limitations*

729

730 This review gains its strengths from the combination of rigorous search and
731 extraction methods and the underlying theoretical framework which guided the
732 analysis. To guard against bias in the undertaking of the review, two reviewers
733 independently extracted all data and where disagreement occurred, these were
734 discussed between authors until agreement was reached.

735

736 The level of quality across included studies was a limiting factor in this review
737 with an average quality rating of 5.5 out of 10 for qualitative studies and 8.75 out
738 of 10 for quantitative work (refer to additional files 3 and 4). There was also a
739 lack of randomised trials evaluating the impact of pet ownership on diagnosed
740 mental health problems. This is perhaps unsurprising given the pragmatic
741 difficulties associated with randomising individuals or families to pet or non-pet
742 owners within RCTs. Prospective experimental or quasi-experimental designed

1 743 studies should be used to compare outcomes for pet owners and non-pet owners
2 744 using measures that adequately incorporate the range of tasks in relation to each
3
4 745 type of work as identified within this review. Given the potential benefits which
5
6 746 might be conveyed by pets for people with mental health conditions, there is a
7
8 747 clear need for further rigorous, high quality research, in order to consolidate
9
10 748 these existing findings and build an evidence base on which commissioners and
11
12 749 policy makers can base decisions.
13
14
15
16

17 750

18
19 751 As part of our inclusion criteria, we included only those with a diagnosable
20
21 752 mental health problem or mental health components of a diagnosable physical
22
23 753 health condition which may have impacted on the studies included in our review.
24
25
26

27 754

28
29 755 *Conclusion*
30
31

32 756

33
34 757 Despite some inadequacies in the data, this review suggests that pets provide
35
36 758 benefits to those with mental health conditions through the intensity of
37
38 759 connectivity with their owners and the contribution they make to emotional
39
40 760 support in times of crises together with their ability to help manage symptoms
41
42 761 when they arise. Further rigorous research is required to test this relationship,
43
44 762 incorporating outcomes that cover the range of roles pets may have in relation to
45
46 763 mental health identified within this review. The research studies included in this
47
48 764 review provide a point of debate that services and policy makers may wish to
49
50 765 consider in the future.
51
52
53
54
55
56

57 766

58
59 767
60
61
62
63
64
65

1	768	List of abbreviations:
2	769	
3		
4	770	AAT – Animal assisted therapy
5		
6	771	AIDS - acquired immunodeficiency syndrome
7		
8	772	DALYs - disability adjusted life years
9		
10	773	HIV - human immunodeficiency virus
11		
12	774	PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses
13		
14	775	PTSD - Posttraumatic stress disorder
15		
16	776	UK - United Kingdom
17		
18	777	USA – United States of America
19		
20	778	WHO – World Health Organisation
21		
22	779	
23		
24	780	Declarations
25		
26	781	
27		
28	782	Ethics approval and consent to participate
29		
30	783	
31		
32	784	Not applicable
33		
34	785	
35		
36	786	Consent for publication
37		
38	787	
39		
40	788	Not applicable
41		
42	789	
43		
44	790	Availability of data and materials
45		
46	791	
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		

792 Data sharing is not applicable to this article as no datasets were generated or
793 analysed during the current study.

794

795 **Competing interests**

796

797 The authors declare that they have no competing interests.

798

799 **Funding**

800

801 This is a summary of independent research funded by the National Institute for
802 Health Research (NIHR)'s Programme Grants for Applied Research Programme
803 (Grant Reference Number RP-PG-1210-12007). The views expressed are those of
804 the author(s) and not necessarily those of the NHS, the NIHR or the Department
805 of Health.

806

807 **Author's contributions**

808

809 HB, KR, PB and AR were involved in the design of the review. HB, KL, KR, LG, LW
810 were involved in screening the identified papers. KR screened all included and
811 excluded studies for validity purposes. AR scrutinized all included studies. HB
812 and KR read all included papers and independently extracted data. HB, KR
813 developed the initial analytical framework which was elaborated on and checked
814 by AR. PB and KL were regularly consulted in the conceptualisation of the paper.
815 All authors read and approved the final manuscript.

816

817 **Acknowledgements**

818

819 The authors would like to thank Rebecca Pedley for her advice and support
820 during the review process and Shu Eu and Katie Robinson for their contributions
821 to the early stages of the review process.

822

823 **References**

824

- 825 1. McManus, S., et al. *Mental Health and Wellbeing in England: Adult*
826 *psychiatry morbidity survey 2014*. 2016 [cited 2017 09.08.2017].
- 827 2. WHO, *The global burden of disease 2004 update*, W.H. Organisation, Editor.
828 2008: Geneva.
- 829 3. WHO, *Global status report on non-communicable diseases 2010*, W.H.
830 Organisation, Editor. 2011: Geneva.
- 831 4. Vassilev, I., et al., *Social networks, social capital and chronic illness self-*
832 *management: a realist review*. Chronic Illness, 2011. 7(1): p. 60-86.
- 833 5. Rogers, A., et al., *Social networks, work and network-based resources for*
834 *the management of long-term conditions: a framework and study protocol*
835 *for developing self-care support*. Implementation Science, 2011. 6(1): p.
836 56.
- 837 6. Bakerjian, D., *Pets impact on quality of life, a case study*. Geriatr Nurs,
838 2014. 35(2): p. 160-3.
- 839 7. Power, E.R., *Dogs and Practices of Community and Neighboring*.
840 Anthrozoös, 2013. 26(4): p. 579-591.

- 841 8. Myers, O., *No longer the lonely species: a post - mead perspective on*
842 *animals and sociology*. International Journal of Sociology and Social Policy,
843 2003. **23**(3): p. 46-68.
- 844 9. Brooks, H., et al., *Ontological security and connectivity provided by pets: a*
845 *study in the self-management of the everyday lives of people diagnosed with*
846 *a long-term mental health condition*. BMC Psychiatry, 2016. **16**(1): p. 409.
- 847 10. Murray, J.K., et al., *Assessing changes in the UK pet cat and dog populations:*
848 *numbers and household ownership*. Vet Rec, 2015. **177**(10): p. 259.
- 849 11. Islam, A. and T. Towell, *Cat and Dog Companionship and Well-being: A*
850 *Systematic Review*. International Journal of Applied Psychology, 2013.
851 **3**(6): p. 149-55.
- 852 12. Maber-Aleksandrowicz, S., C. Avent, and A. Hassiotis, *A Systematic Review*
853 *of Animal-Assisted Therapy on Psychosocial Outcomes in People with*
854 *Intellectual Disability*. Res Dev Disabil, 2016. **49-50**: p. 322-38.
- 855 13. O'Haire, M.E., *Animal-assisted intervention for autism spectrum disorder: a*
856 *systematic literature review*. J Autism Dev Disord, 2013. **43**(7): p. 1606-22.
- 857 14. Kamioka, H., et al., *Effectiveness of animal-assisted therapy: A systematic*
858 *review of randomized controlled trials*. Complement Ther Med, 2014.
859 **22**(2): p. 371-90.
- 860 15. Lundqvist, M., et al., *Patient benefit of dog-assisted interventions in health*
861 *care: a systematic review*. BMC Complement Altern Med, 2017. **17**(1): p.
862 358.
- 863 16. Munoz Lasa, S., et al., *Animal assisted interventions in neurorehabilitation:*
864 *a review of the most recent literature*. Neurologia, 2015. **30**(1): p. 1-7.

- 865 17. Stapleton, M., *Effectiveness of Animal Assisted Therapy after brain injury: A*
866 *bridge to improved outcomes in CRT*. NeuroRehabilitation, 2016. **39**(1): p.
867 135-40.
- 868 18. Moher, D., et al., *Preferred reporting items for systematic reviews and meta-*
869 *analyses: the PRISMA statement*. BMJ, 2009. **339**: p. b2535.
- 870 19. Corbin, J. and A. Strauss, *Unending work and care: managing chronic illness*
871 *at home*, ed. Jossey-Bass. 1988, San Francisco: Jossey-Bass Publishers.
- 872 20. Walker, S., et al., *How do people with long-term mental health problems*
873 *negotiate relationships with network members at times of crisis?*. Health
874 Expectations, 2017. **In Press**.
- 875 21. Vassilev, I., et al., *The influence of social networks on self-management*
876 *support: a metasynthesis*. BMC Public Health, 2014. **14**(1): p. 719.
- 877 22. Rogers, A., et al., *Why less may be more: a mixed methods study of the work*
878 *and relatedness of 'weak ties' in supporting long-term condition self-*
879 *management*. Implementation Science, 2014. **9**(1): p. 19.
- 880 23. Leamy, M., et al., *Conceptual framework for personal recovery in mental*
881 *health: systematic review and narrative synthesis*. Br J Psychiatry, 2011.
882 **199**(6): p. 445-52.
- 883 24. Thomas, B.H., et al., *A process for systematically reviewing the literature:*
884 *providing the research evidence for public health nursing interventions*.
885 Worldviews Evid Based Nurs, 2004. **1**(3): p. 176-84.
- 886 25. Tong, A., et al., *Enhancing transparency in reporting the synthesis of*
887 *qualitative research: ENTREQ*. BMC Medical Research Methodology, 2012.
888 **12**(1): p. 181.

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
- 889 26. Thomas, J. and A. Harden, *Methods for the thematic synthesis of qualitative*
890 *research in systematic reviews*. BMC Med Res Methodol, 2008. **8**: p. 45.
- 891 27. Hunt, M.G. and C.H. Stein, *Who let the dogs in? A pets policy for a supported*
892 *housing organization*. American Journal of Psychiatric Rehabilitation,
893 2007. **10**(3): p. 163-183.
- 894 28. Pehle, M.A., *Healing relationships with companion dogs in the therapeutic*
895 *process: An exploratory qualitative study*. **AAI3406177**: p. 3365.
- 896 29. Satterfield, P., *Life satisfaction of chronic pain sufferers with companion*
897 *animals*. Dissertation Abstracts International: Section B: The Sciences and
898 Engineering, 2014. **74**(9-B(E)): p. No Pagination Specified.
- 899 30. Stern, S.L., et al., *Potential benefits of canine companionship for military*
900 *veterans with posttraumatic stress disorder (PTSD)*. Society and animals,
901 2013. **21**(6): p. 568-581.
- 902 31. White, M., *The human-animal bond and combat-related posttraumatic*
903 *stress symptoms*. Dissertation Abstracts International: Section B: The
904 Sciences and Engineering, 2014. **75**(2-B(E)): p. No Pagination Specified.
- 905 32. Wisdom, J.P., G.A. Saedi, and C.A. Green, *Another Breed of "Service"*
906 *Animals: STARS Study Findings About Pet Ownership and Recovery From*
907 *Serious Mental Illness*. American journal of orthopsychiatry, 2009. **79**(3):
908 p. 430-436.
- 909 33. Siegel, J.M., et al., *AIDS diagnosis and depression in the Multicenter AIDS*
910 *Cohort Study: the ameliorating impact of pet ownership*. AIDS Care, 1999.
911 **11**(2): p. 157-70.
- 912 34. Carmack, B., *The role of companion animals for persons with AIDS/HIV*.
913 1991.

- 914 35. Wells, D.L., *Associations Between Pet Ownership and Self-Reported Health*
915 *Status in People Suffering from Chronic Fatigue Syndrome*. Journal of
916 Alternative and Complementary Medicine, 2009. **15**(4): p. 407-413.
- 917 36. Ford, V., *What role, if any, can companion animals play in recovery from*
918 *serious mental health difficulties?* 2012, University of Surrey.
- 919 37. McNicholas, J., *Pet Ownership and Health*. 1998, University of Warwick.
- 920 38. Zimolag, U. and T. Krupa, *The Occupation of Pet Ownership as an Enabler of*
921 *Community Integration in Serious Mental Illness: A Single Exploratory Case*
922 *Study*. Occupational Therapy in Mental Health, 2010. **26**(2): p. 176-196.
- 923 39. Zimolag, U. and T. Krupa, *Pet Ownership as a Meaningful Community*
924 *Occupation for People With Serious Mental Illness*. American Journal of
925 Occupational Therapy, 2009. **63**(2): p. 126-137.
- 926 40. Rijken, M. and S. Beek, *About cats and dogs... Reconsidering the relationship*
927 *between pet ownership and health related outcomes in community-dwelling*
928 *elderly*. Social Indicators Research, 2011. **102**(3): p. 373-388.
- 929 41. Bradley, L. and P.C. Bennett, *Companion-animals' effectiveness in*
930 *managing chronic pain in adult community members*. Anthrozoos, 2015.
931 **28**(4): p. 635-647.
- 932 42. Bystrom, K.M. and C.A. Persson, *The meaning of companion animals for*
933 *children and adolescents with autism: The parents' perspective*.
934 Anthrozoos, 2015. **28**(2): p. 263-275.
- 935 43. Boardman, J., *Social exclusion and mental health – how people with mental*
936 *health problems are disadvantaged: an overview*. Mental Health and Social
937 Inclusion, 2011. **15**(3): p. 112-121.
- 938 44. Stallones, L., *Pet Loss and Mental Health*. Anthrozoös, 1994. **7**(1): p. 43-54.

- 939 45. Hunt, M., H. Al-Awadi, and M. Johnson, *Psychological Sequelae of Pet Loss*
940 *Following Hurricane Katrina*. Anthrozoös, 2008. **21**(2): p. 109-121.
941 46. Lowe, S.R., et al., *The Impact of Pet Loss on the Perceived Social Support*
942 *and Psychological Distress of Hurricane Survivors*. Journal of traumatic
943 stress, 2009. **22**(3): p. 244-247.

944
945 **Additional files**

946
947 File name: Additional file 1.docx

948 Title of data: Context Table

949 Description of data: Extracted context data from each included study

950

951 File name: Additional file 2.docx

952 Title of data: Participants Table

953 Description of data: Extracted data related to study participants from each

954 included study

955

956 File name: Additional file 3.docx

957 Title of data: Qualitative Quality Table

958 Description of data: Quality scores related to the included qualitative studies

959

960 File name: Additional file 4.docx

961 Title of data: Quantitative Quality Table

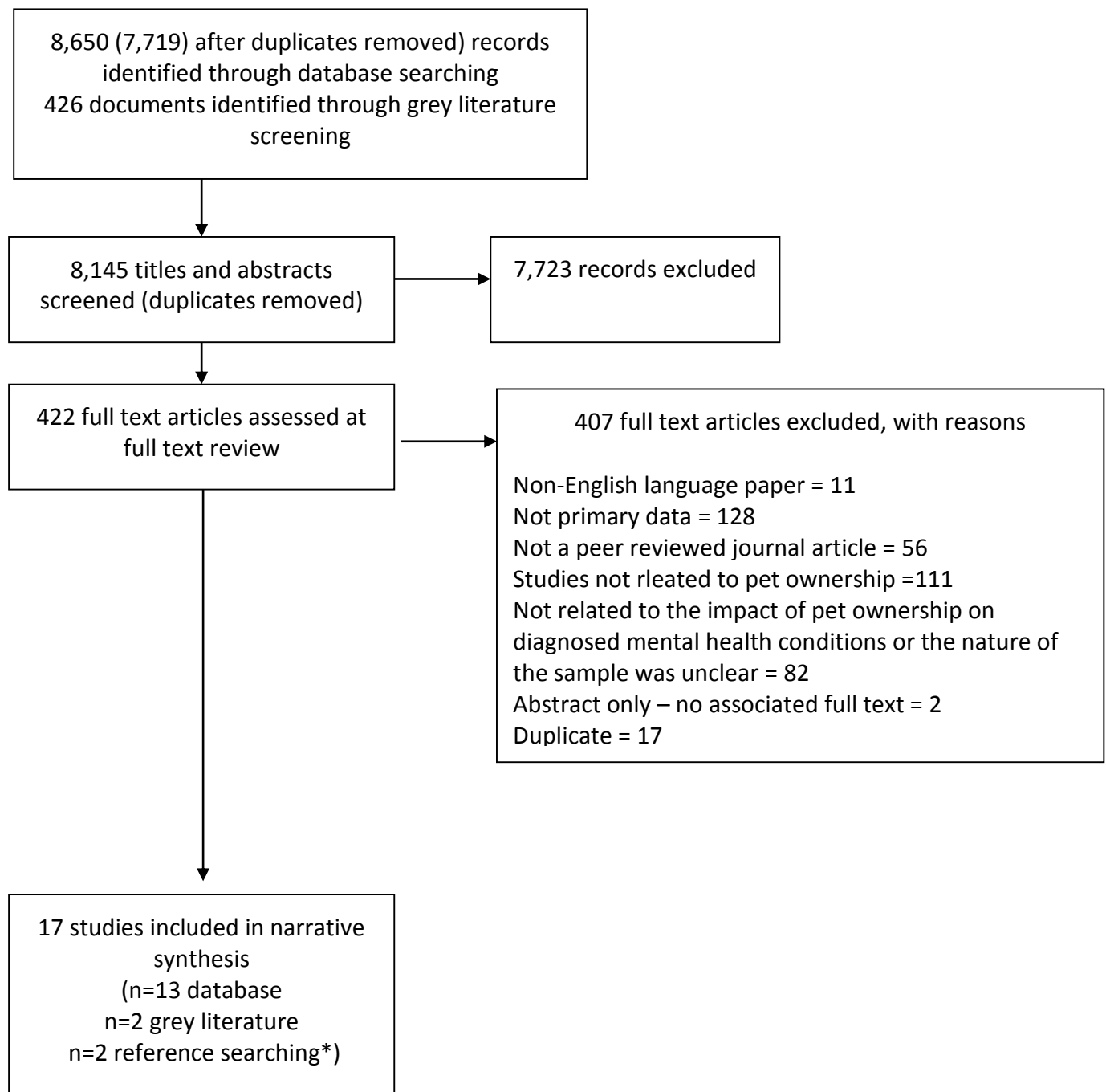
962 Description of data: Quality scores related to the included quantitative studies

963

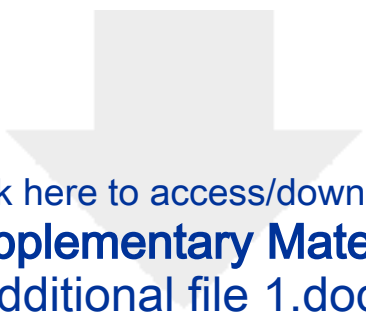
964

965

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30
- 31
- 32
- 33
- 34
- 35
- 36
- 37
- 38
- 39
- 40
- 41
- 42
- 43
- 44
- 45
- 46
- 47
- 48
- 49
- 50
- 51
- 52
- 53
- 54
- 55
- 56
- 57
- 58
- 59
- 60
- 61
- 62
- 63
- 64
- 65



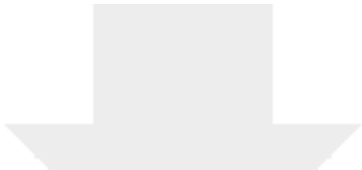
*Two articles identified through searching of reference list of included articles so not included in earlier stages of the review.



Click here to access/download
Supplementary Material
Additional file 1.docx







Click here to access/download
Supplementary Material
Additional file 4.docx

